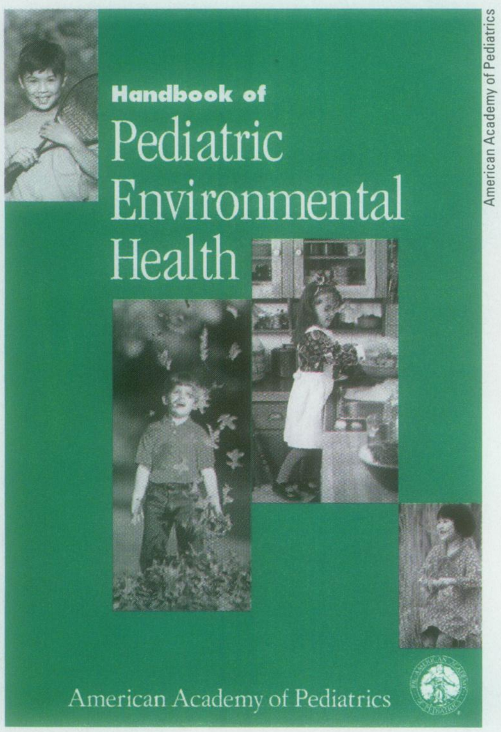
Since we have no choice but to be swept along by [this] vast technological surge, we might as well learn to surf.
Michael Soule
Conservation for the 21st Century, 1989

Environmental Handbook

In recent years, children's environmental health has become a dominant public policy issue and a focus of epidemiology and medical research. On 10 October 1999, the American Academy of Pediatrics released the *Handbook of Pediatric Environmental Health*, a 400-page desk reference written by pediatricians for pediatricians. The handbook pulls together clinically relevant information on children's environmental health and presents it to the practitioner in one easily accessible location. Says Ruth Etzel, a pediatrician and epidemiologist with the U.S. Public Health Service in Washington, DC, and the handbook's editor, "The handbook is the first of its kind. It's geared toward helping a doctor to assess a child with a health problem to determine whether the problem is linked to an environmental hazard." The book may also help pediatricians answer parent questions about how the environment may influence their children's health.



The specific topics covered in the handbook include prevention of exposure to nitrates and recognition of methemoglobinemia in children, diagnosis of acute pulmonary hemorrhage in infants associated with exposure to toxigenic molds, and more general topics such as lead and mercury poisoning and risks from exposure to ultraviolet light and outdoor air pollution.

The handbook, informally referred to as the Green Book, was written by the academy's Committee on Environmental Health (chaired by Etzel), which was created in 1957 to respond to pediatricians' concerns about fallout from weapons testing and fears of nuclear war. The book is arranged in four sections: background that instructs pediatricians on the subtleties of taking a comprehensive environmental history; a list of specific pollutants; information on the risks of specific materials, environments, and occupations; and discussion on complex issues such as multiple chemical sensitivity and environmental justice.

Sophie J. Balk, a pediatrician at the Montefiore Medical Center in the Bronx, New York, who assisted Etzel in editing the handbook, says that, although the book is geared mainly toward pediatricians, it also contains information that could be useful for parents and school nurses. "It's very practical and easy to use," she says. "Most of the chapters are followed by a section including frequently asked questions and answers."

The chapter on environmental tobacco smoke, for example, includes guidance on smoking cessation and a description of the health benefits that come with removing the exposure. According to Etzel, exposure to secondhand smoke is a major pediatric environmental health problem associated with increased risk of ear infections, sudden infant death syndrome, and asthma.

Many of the patients that Balk sees in her inner-city clinic have asthma, which is a growing problem among minority children in low-income urban environments. Balk says that the handbook provides useful information for clinicians who diagnose and treat asthma. For instance, there is information on environmental triggers of asthma as well as practical treatment and prevention measures such as how to get rid of the roaches, dust mites, and molds that can exacerbate the condition.

Balk emphasizes that pediatricians confronted with a child with a complex or potentially life-threatening situation such as acute poisoning should consult a pediatric specialist for immediate guidance on appropriate treatment. But for most situations, practitioners will be able to turn to the new handbook for referencing a wealth of pertinent information designed to facilitate diagnosis, treatment, and prevention, as well as improve education regarding environmental health problems in children. The AAP can be accessed through its Web site, located at **http://www.aap.org**.

Ulcer-Causing Bacterium Found in Well Water

Although the primary mode of transmission of *Helicobacter pylori*—the bacterium that causes 75% of stomach ulcers—is unknown, experts suspect some type of person-to-person route of infection, perhaps fecal–oral or oral–oral. Now, researchers in the Department of Environmental Engineering at Pennsylvania State University at Harrisburg are the first U.S. scientists to report preliminary data linking contaminated drinking water with *H. pylori* infection.

In 1983, two Australian physicians first isolated a spiral-shaped bacterium (later named *H. pylori*) from ulcer patients and proposed that it caused gastritis (stomach inflammation) and ulcers. However, few physicians accepted the idea because stress and acidic foods were believed to be the cause of ulcers. To convince the medical community, the Australian researchers swallowed *H. pylori* and demonstrated that their digestive tracts subsequently became inflamed. The bacterium is now accepted as the major cause of stomach ulcers. Moreover, *H. pylori* is associated with two cancers, gastric carcinoma and lymphoma of the mucosa-associated lymphoid tissue (MALT). In fact, the presence of *H. pylori* confers about a six-fold risk of gastric cancer, which is the second most common cancer worldwide, and biopsies show that 90% of MALT lymphomas are associated with the bacterium. More recently, Italian researchers reported in the 5 May 1998 issue of *Circulation* that *H. pylori* may contribute to heart disease by causing low-grade, lifelong infections and smoldering inflammation. In their study of 88 heart disease patients and 88 controls, *H. pylori* was found in 62% of people with heart disease and only 40% of those without the disease.

In 1998, the Penn State Harrisburg team, headed by microbiologist Katherine H. Baker, discovered that *H. pylori* contaminated surface water and shallow private wells in rural areas of Pennsylvania and Ohio. Of 42 surface water samples and 20 shallow private well samples collected, 40% and 65% of samples, respectively, tested positive for *H. pylori*. The findings demonstrate a major reservoir for the bacterium outside the human body and support the possibility of a waterborne transmission route of *H. pylori*.

A traditional indicator of microbial water quality involves testing for coliforms (microbes used as markers of fecal contamination) such as *Campylobacter* and *Salmonella*. Baker found that approximately 85% of the surface water samples contained coliforms. However, in four well water samples, *H. pylori* was detected in the absence of coliforms, suggesting that routine screening of water supplies for such bacteria may fail to protect consumers from exposure to *H. pylori*. These findings have been accepted for publication in the *Journal of Applied Microbiology*.

Baker and her team also analyzed water samples from the private wells of 10 people who were diagnosed with *H. pylori*-related illnesses or who had concerns about their drinking water source. Samples of tap water were collected and eight of the wells were found to be contaminated with *H. pylori*. The small sample size "is definitely a limitation of the study," says Baker, but the statistical agreement "is enough to raise a red flag." This first direct link between contaminated drinking water and stomach ulcers was presented 2 June 1999 at the American Society for Microbiology meeting held in Chicago, Illinois.

Baker suspects that *H. pylori* contamination of private well water could be caused by other household members infected with *H. pylori*; since the bacterium is believed to be transmitted through fecal–oral transmission, septic tanks could contribute to private well contamination. Although septic tanks should be located at least 100 feet from drinking water wells, siting regulations often are not enforced in rural areas. In one case, Baker found a well just 15 feet from a septic field.

Unfortunately for private well owners, testing for *H. pylori* is not a routine laboratory task. Baker uses an expensive and time-consuming research method that involves a commercial monoclonal antibody specific for *H. pylori* and immunofluorescence, followed by direct microscopic examination. "The last thing I want is people paying a lot of money to have their water tested for *H. pylori*," says Baker. Instead, she recommends that people with well water have it checked for coliforms, an inexpensive test performed by local health departments. "The presence of coliforms is a good, but not absolute, indicator of the likelihood of *H. pylori*," Baker says. Levels of chlorine that kill coliforms also kill *H. pylori*. For this reason, municipal water supplies treated with chlorine will not be contaminated with *H. pylori*.

Scientists Find MTBE Degrades Naturally

The reformulated gasoline additive methyl *tert*-butyl ether (MTBE) is a mixed blessing: the oxygen it contains decreases the production of smog-producing carbon monoxide during combustion, but it can be a pollutant in its own right, and it is classified as a possible human carcinogen by the U.S. Environmental Protection Agency (EPA). But the scales may be tipping, thanks to a study published in the 1 June 1999 issue of *Environmental Science & Technology* in which scientists found that naturally occurring microbes can digest MTBE and convert it into less toxic by-products.

MTBE enters the environment by leaking from underground gasoline storage tanks and through gasoline that evaporates as vehicles are being fueled. It migrates much more quickly through the soil than most petroleum distillates and has been found in groundwater at numerous sites in the United States. Despite MTBE's utility in reducing carbon monoxide, in July the EPA suggested to Congress that the use of the chemical be "reduced substantially" (the phrase was not defined further) because of fears over water contamination. In California, where traces of MTBE have been measured in 10,000 wells, the state has ordered a phaseout of the additive by 2002.

In the June *Environmental Science & Technology* article, researchers from the U.S. Geological Survey in Columbia, South Carolina, reported on a study in which they extracted sediment from beneath two streambeds that received groundwater discharge from storage tanks that had each leaked about 1,000 gallons of gasoline containing MTBE. The study sites were "typical, garden-variety underground storage tank releases that were adjacent to sensitive receptors," says research hydrologist James Landmeyer, an author of the study. "We didn't want something so unique that the results would not be transferable to other locations." The sediments were taken from an aerobic zone of sand and gravel about 2 inches below the streambed.

In the laboratory, the researchers added radioactively labeled MTBE to the sediment samples, then measured how much radioactive carbon dioxide was produced as an indicator of how much MTBE was degraded. After 100 days, microorganisms from one site had degraded 30% of the MTBE. The comparable number for the other site was 73%. The reason for the difference is unclear. The degradation only occurred, however, in samples that were maintained in aerobic conditions. MTBE was not degraded when oxygen was not available or when the samples had been heated to kill microbes. After 80 days, 84% of *tert*-butyl alcohol, another component of reformulated gasoline, had also been degraded in samples from both sites.

"Our results indicate that [certain] microorganisms are able to degrade MTBE to nontoxic by-products if oxygen is present in the microbial environment," says lead author Paul Bradley. The decay microbes have not been identified yet, but the researchers suspect that a community of microbes is responsible.

Although the samples were taken from active spill sites, there is evidence that the decay process is more effective in nature than in the laboratory. The maximum groundwater concentration of MTBE at

Microbial maids? New research suggests that naturally occurring microbes in streams may degrade the gasoline additive MTBE, which is leaked into groundwater from underground storage tanks.